# Plant immunity discovery boosts chances of disease-resistant crops

July 28 2011

Researchers funded by the Biotechnology and Biological Sciences Research Council (BBSRC) have opened up the black box of plant immune system genetics, boosting our ability to produce disease- and pest-resistant crops in the future. The research is published this evening (28 July) in the journal *Science*.

An international consortium of researchers, including Professor Jim Beynon at the University of Warwick, has used a systems biology approach to uncover a huge network of genes that all play a part in defending plants against attacks from pests and diseases – a discovery that will make it possible to explore new avenues for crop improvement and in doing so ensure future food security.

Professor Beynon said "Plants have a basic defence system to keep out potentially dangerous organisms. Unfortunately some of these organisms have, over time, evolved the ability to overcome plant defences and so plant breeders are always looking for new ways to catch them out. Understanding exactly how plant immunity works is key to making developments in this area."

Professor Beynon's team looked at downy mildew as an example of a plant disease. This is caused by mould-like organism called Hyaloperonospora parasitica, which, like many organisms that infect plants, produces proteins that it introduces into the plant to undermine its natural defences.

The team studied almost 100 different so-called effector proteins from Hyaloperonospora parasitica that are known to be involved in overcoming a plant's immune system. They were looking to see how each of these proteins has an effect through interaction with other proteins that are already present in a plant. They found a total of 122 plant proteins from the commonly-studied plant Arabidopsis thaliana that are directly targeted by the proteins from Hyaloperonospora parasitica.

Professor Beynon continued "This shows that there are many more plant proteins involved in immunity than we first thought. By studying the genes that give rise to these proteins we can start to identify key genetic targets for crop improvement."

The study has also identified many complex connections between the plant proteins suggesting that the network of activity is crucial in plant defences.

Professor Beynon concluded "Our discovery suggests that looking for single genes that confer resistance to pests and diseases is not going to be sufficient. Instead, researchers and breeders will have to work together to produce plants with robust networks of genes that can withstand attack."

Professor Douglas Kell, Chief Executive, BBSRC said "Understanding the fundamental bioscience of plants is critical if we are to develop new ways of producing sustainable, safe, and nutritious food for a growing population. This discovery opens up a whole realm of possibilities in research about plant-pathogen interactions. It also points the way to new ways of working in this area; with a complex network operating behind the scenes in plant immunity, there is a clear need to take a systems approach to future research."